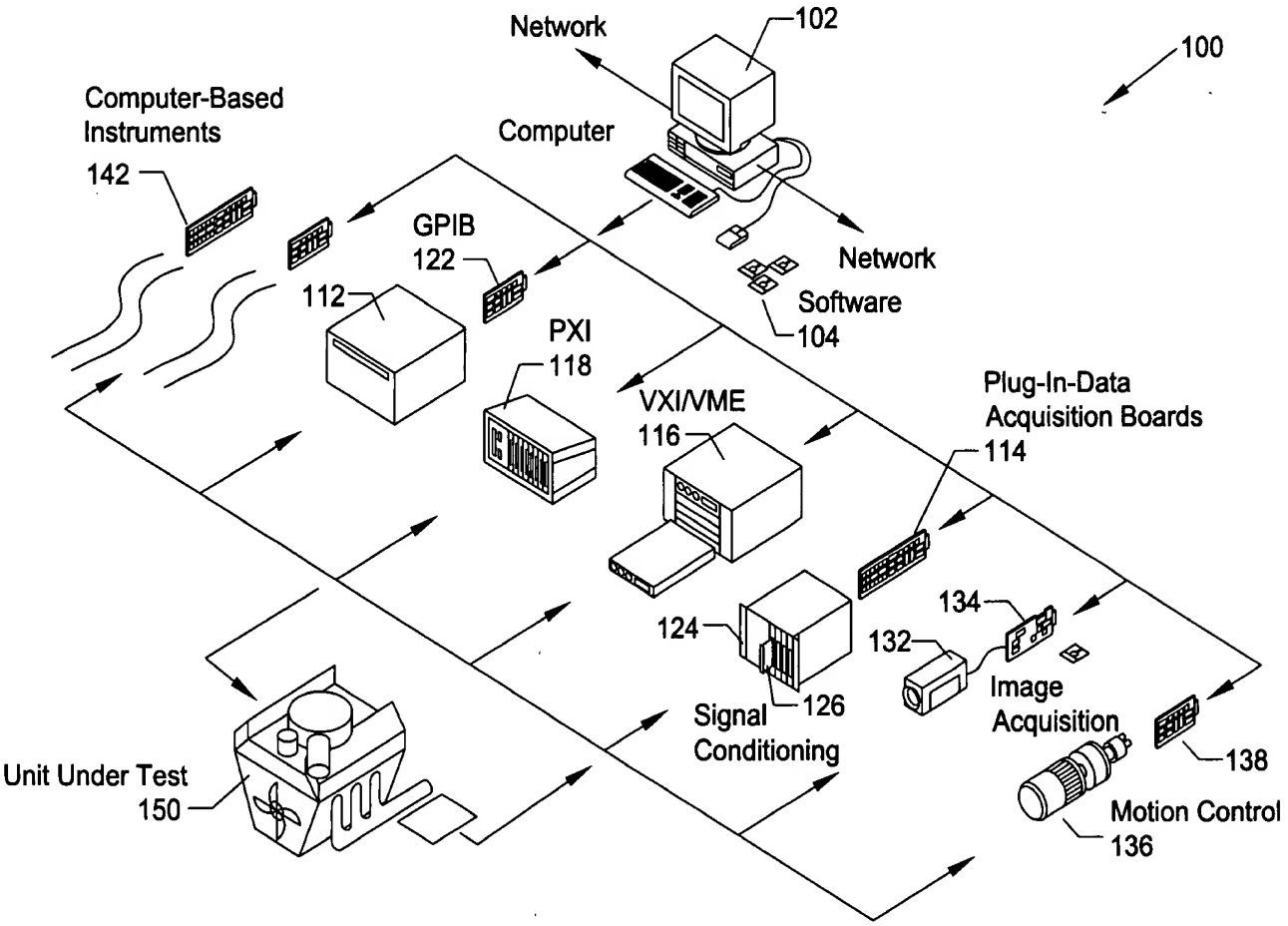
Network
102
100
Computer-Based
Instruments
142
Computer
GPIB
122
112
Network
Software
104
PXI
118
VXI/VME
116
Plug-In-Data
Acquisition Boards
114
134
124
132
Image
Acquisition
Signal
Conditioning
126
138
Unit Under Test
150
Motion Control
136

FIG. 1A

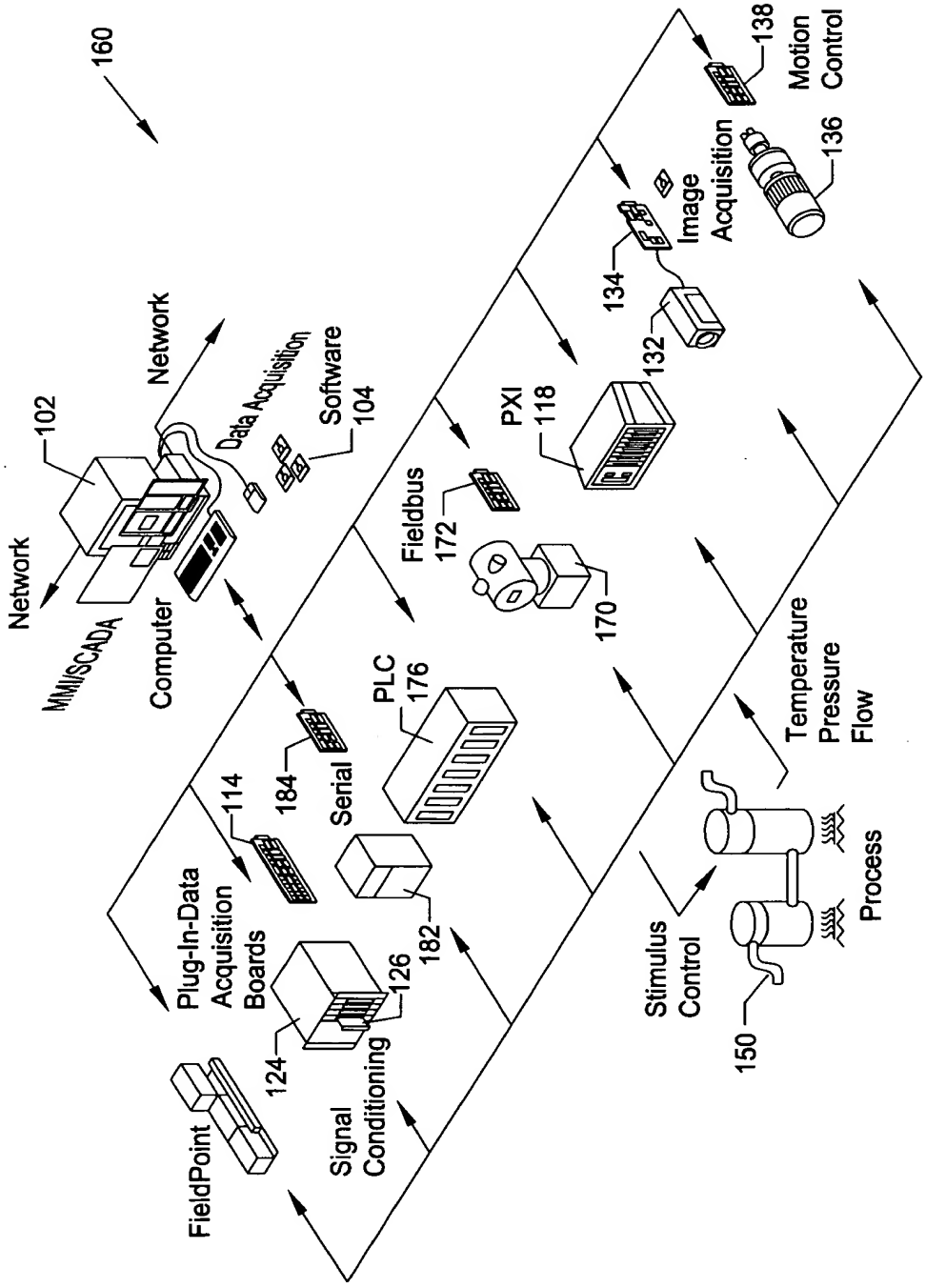
160
Network
102
MIM/SCADA
Computer
Network
Data Acquisition
Software
104
Fieldbus
172
PXI
118
132
134
Image
Acquisition
136
138
Motion
Control
170
PLC
176
Serial
184
114
Plug-In-Data
Acquisition
Boards
126
182
124
Signal
Conditioning
FieldPoint
Stimulus
Control
150
Temperature
Pressure
Flow
Process

FIG. 1B

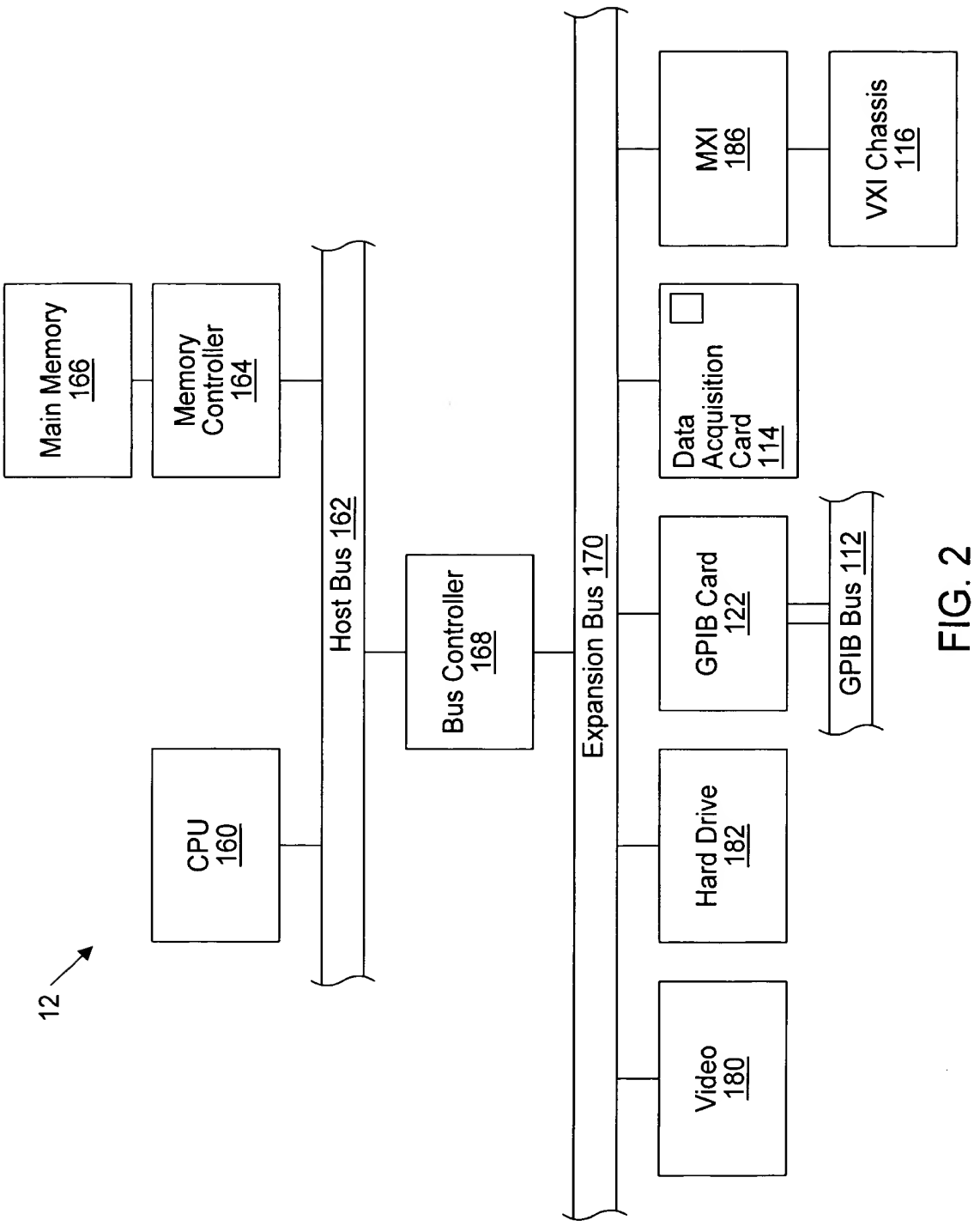
12
CPU 160
Main Memory 166
Memory Controller 164
Host Bus 162
Bus Controller 168
Expansion Bus 170
Video 180
Hard Drive 182
GPIB Card 122
GPIB Bus 112
Data Acquisition Card 114
MXI 186
VXI Chassis 116

FIG. 2

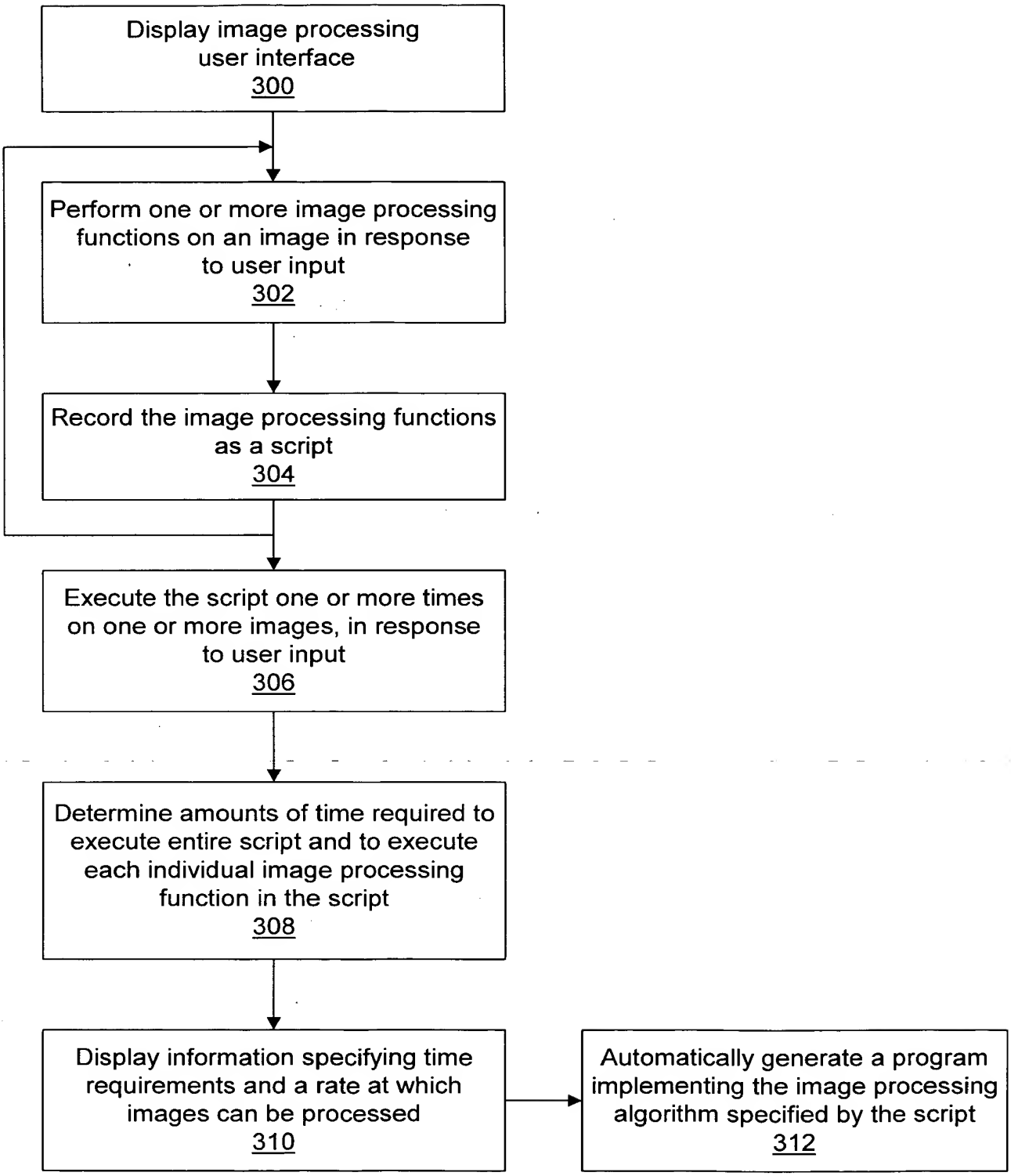
Display image processing user interface
300
Perform one or more image processing functions on an image in response to user input
302
Record the image processing functions as a script
304
Execute the script one or more times on one or more images, in response to user input
306
Determine amounts of time required to execute entire script and to execute each individual image processing function in the script
308
Display information specifying time requirements and a rate at which images can be processed
310
Automatically generate a program implementing the image processing algorithm specified by the script
312

FIG. 3

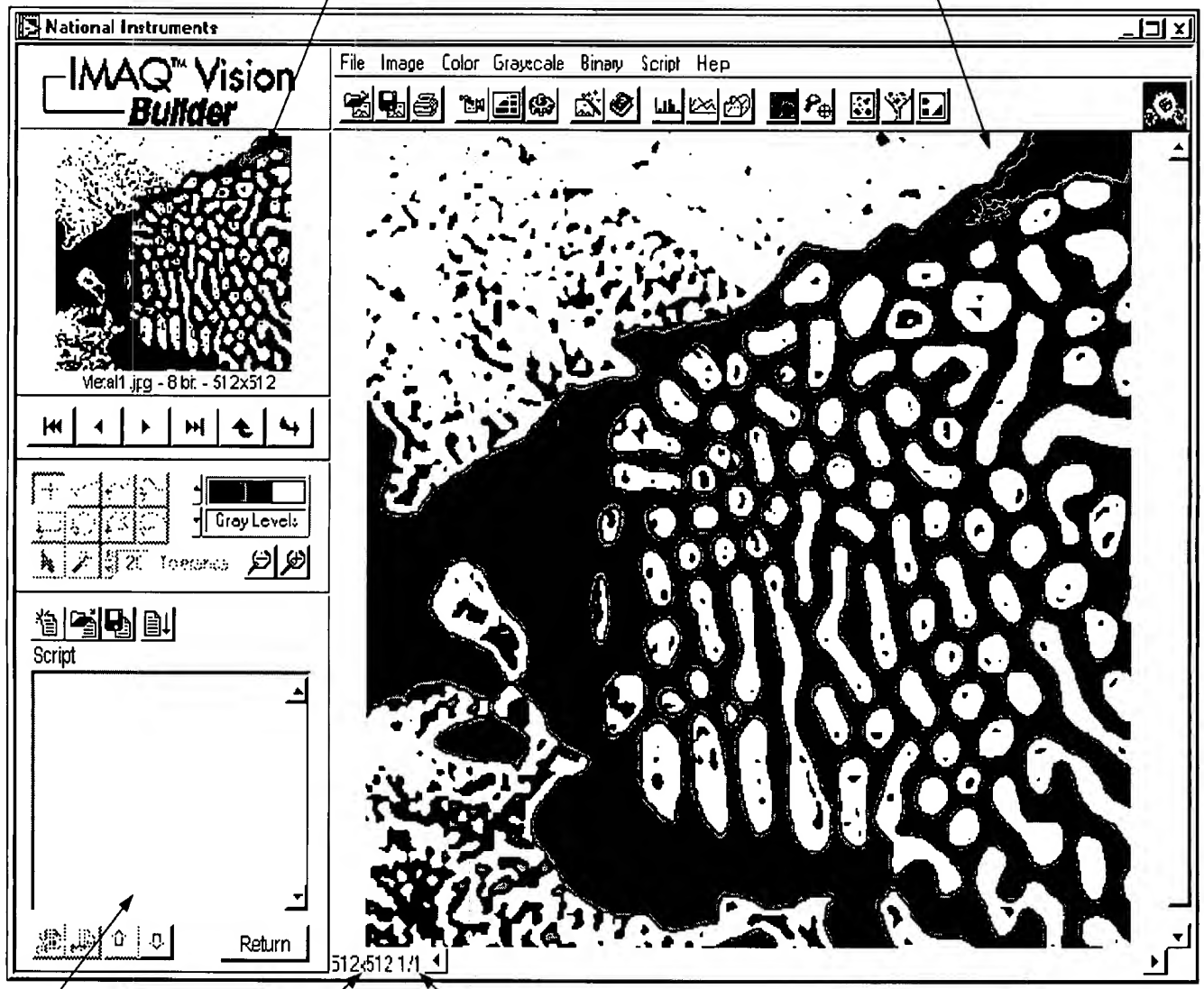
Reference Window
Processing Window
National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Help
viewal1.jpg - 8 bit - 512x512
Gray Levels
Script
Return
512x512 1:1
Script Window
Image Size
Zoom Window

FIG. 4

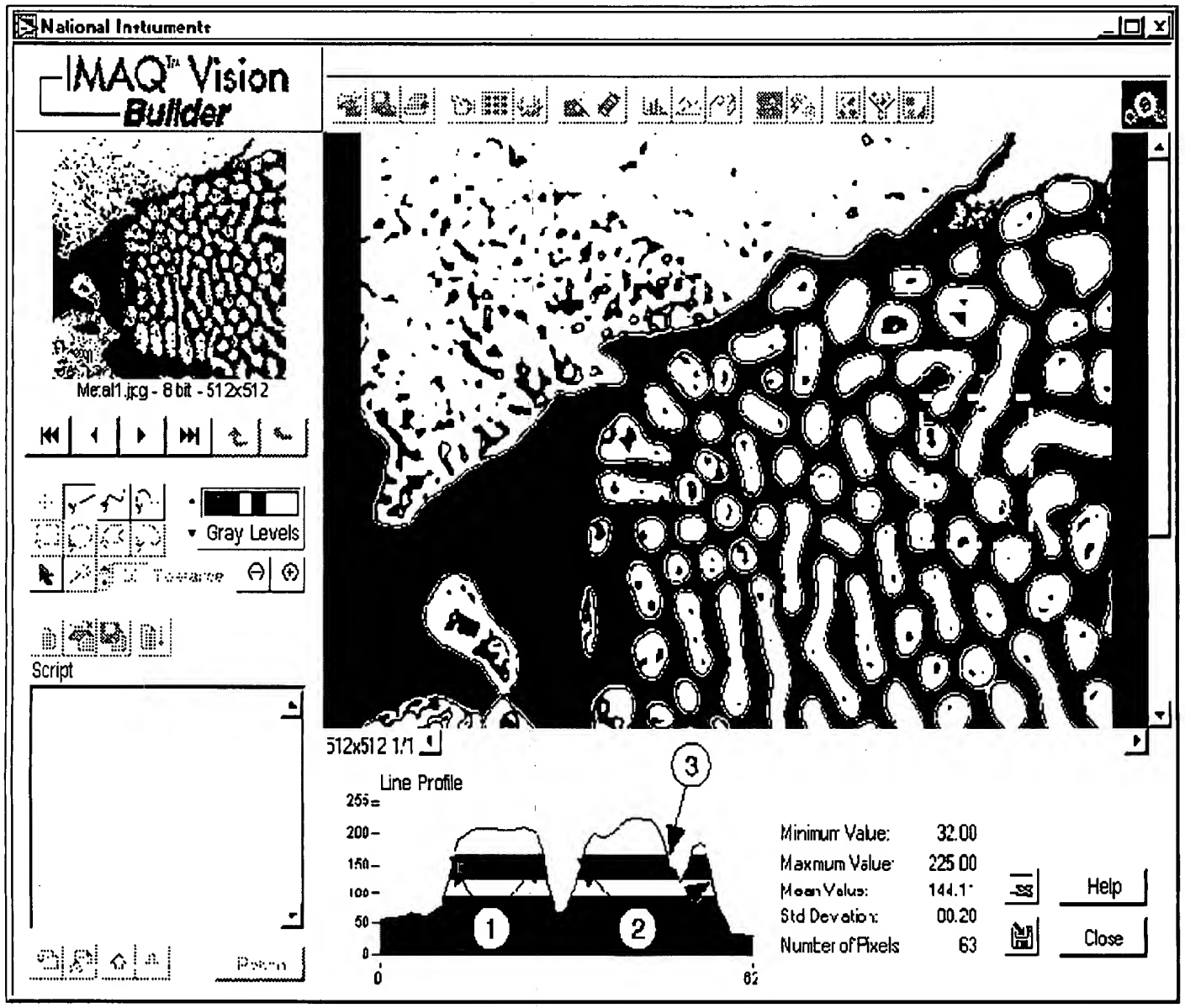
National Instruments
IMAQ Vision Builder
Metal1.jpg - 8 bit - 512x512
Gray Levels
Tolerance
Script
Perim
512x512 1:1
Line Profile
255
200
150
100
50
0
0
62
1
2
3
Minimum Value: 32.00
Maximum Value: 225.00
Mean Value: 144.1
Std Deviation: 00.20
Number of Pixels 63
Help
Close

FIG. 5

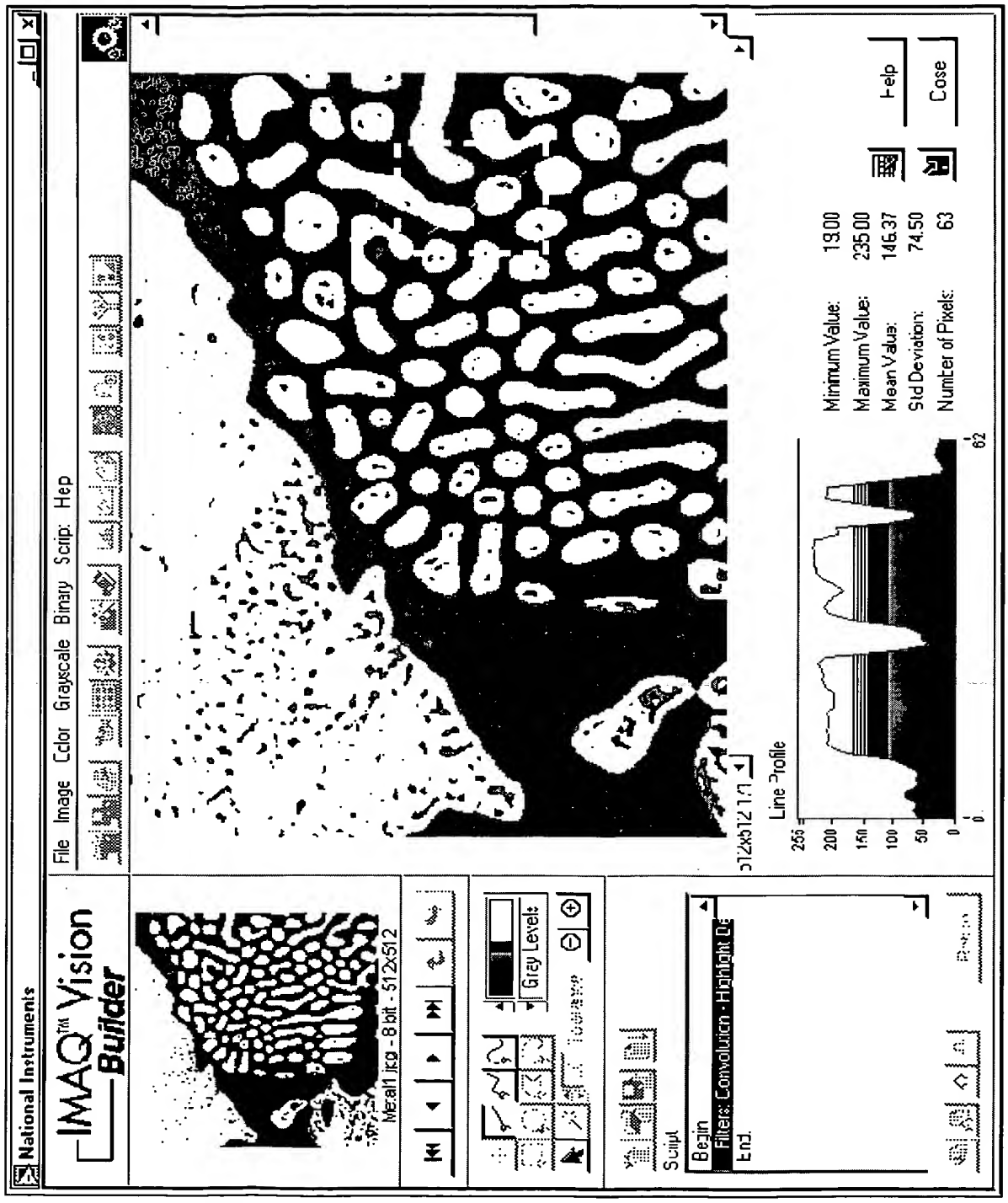
National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Help
Metal1.jpg - 8 bit - 512x512
Gray Levels
Script
Begin
Filters: Convolution - Highpass
End
Line Profile
Minimum Value: 13.00
Maximum Value: 235.00
Mean Value: 146.37
Std Deviation: 74.50
Number of Pixels: 63
Help
Close

FIG. 6

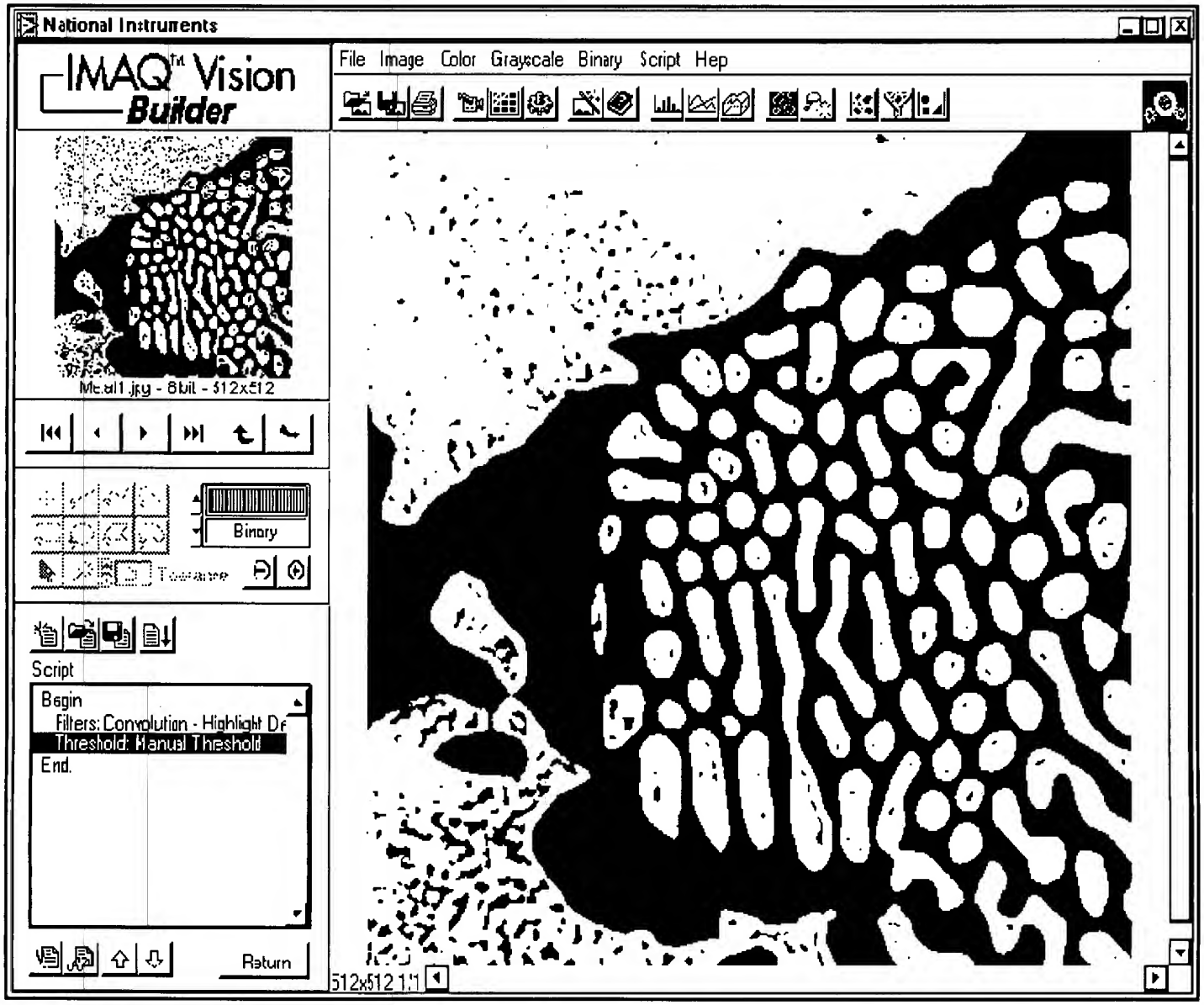
National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Help
Metal1.jpg - 8bit - 512x512
Binary
Script
Begin
Filters: Convolution - Highlight Dr
Threshold: Manual Threshold
End.
Return
512x512 1:1

FIG. 7

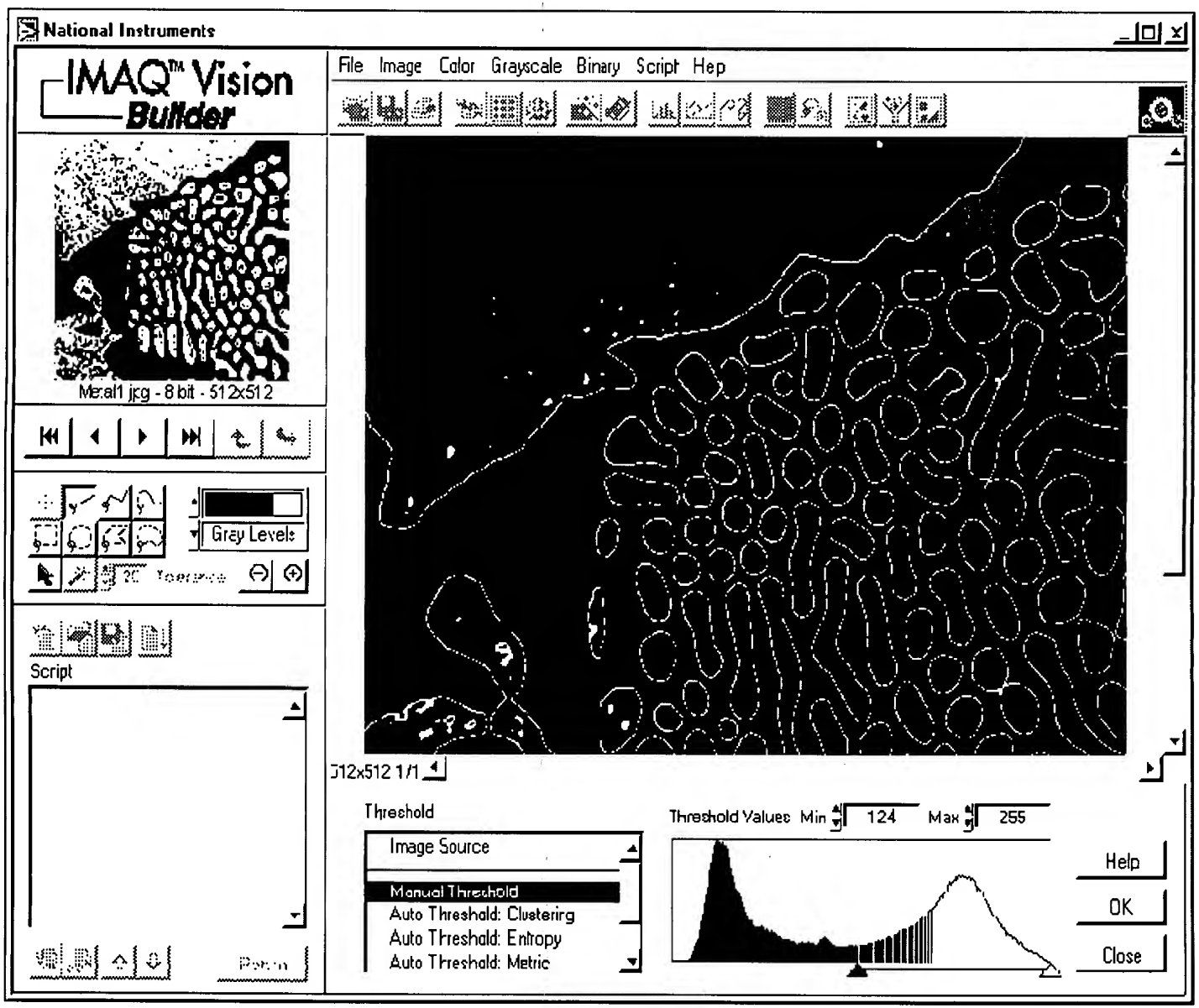
National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Help
Metal1.jpg - 8 bit - 512x512
Gray Levels
Script
512x512 1/1
Threshold
Image Source
Manual Threshold
Auto Threshold: Clustering
Auto Threshold: Entropy
Auto Threshold: Metric
Threshold Values Min 124 Max 255
Help
OK
Close

FIG. 8

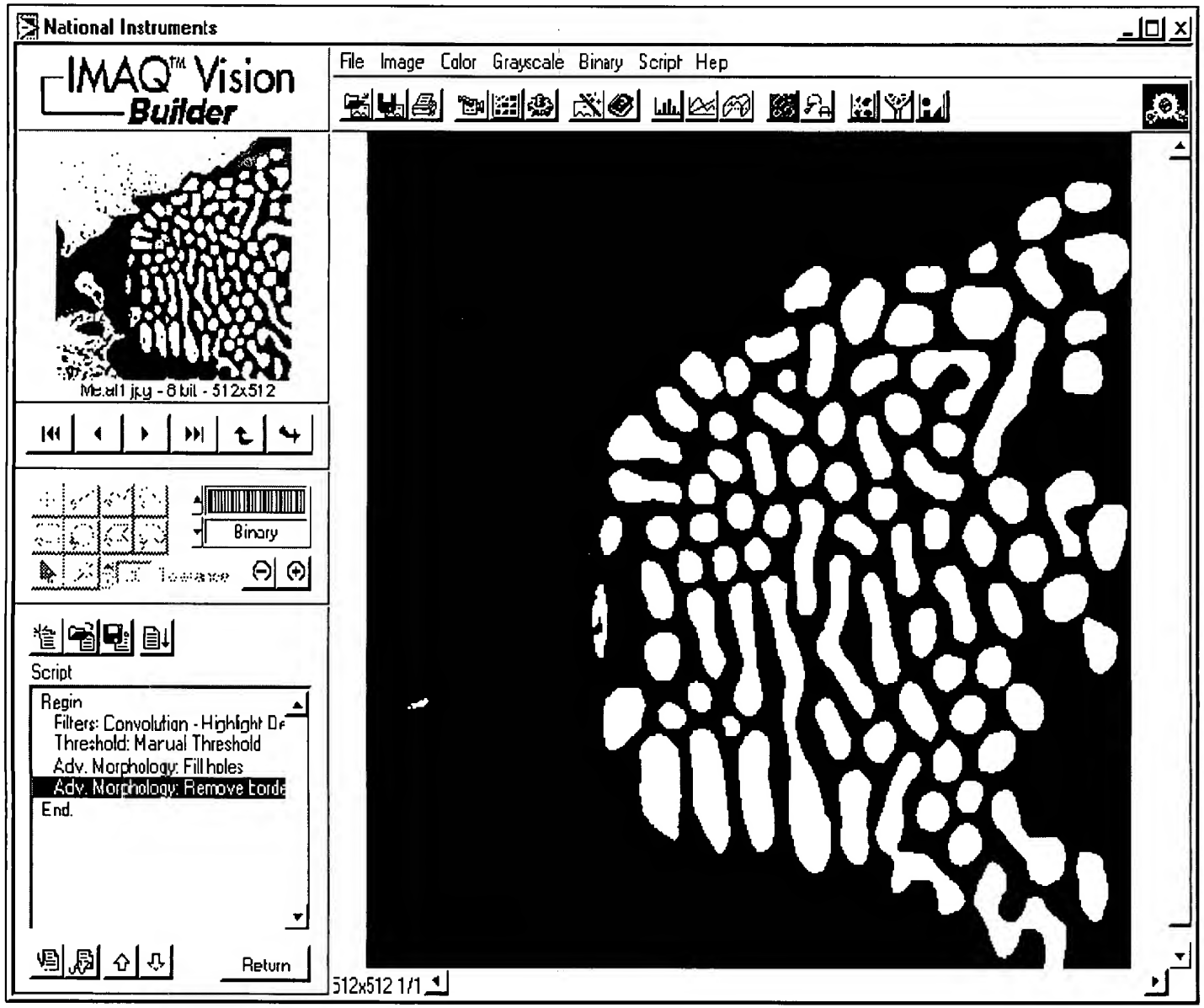
National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Hep
Metal1.jpg - 8 bit - 512x512
Binary
Script
Begin
Filters: Convolution - Highlight De
Threshold: Marual Threshold
Adv. Morphology: Fill holes
Adv. Morphology: Remove borde
End.
Return
512x512 1/1

FIG. 9

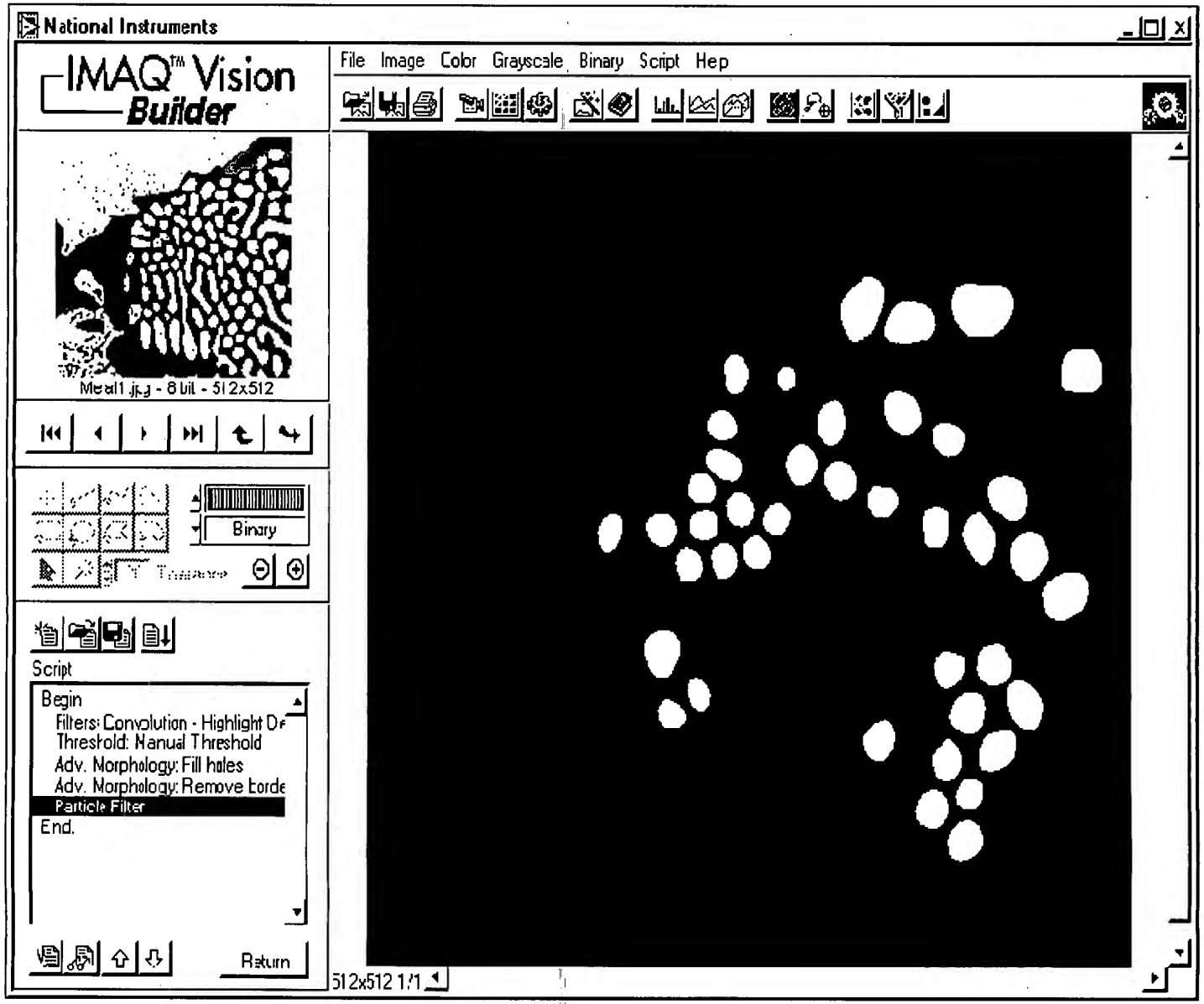
National Instruments
IMAQ™ Vision Builder
File Image Color Grayscale Binary Script Hep
Meal1.jpg - 8 bit - 512x512
Binary
Script
Begin
Filters: Convolution - Highlight De
Threshold: Manual Threshold
Adv. Morphology: Fill holes
Adv. Morphology: Remove Borde
Particle Filter
End.
Return
512x512 1:1

FIG. 10

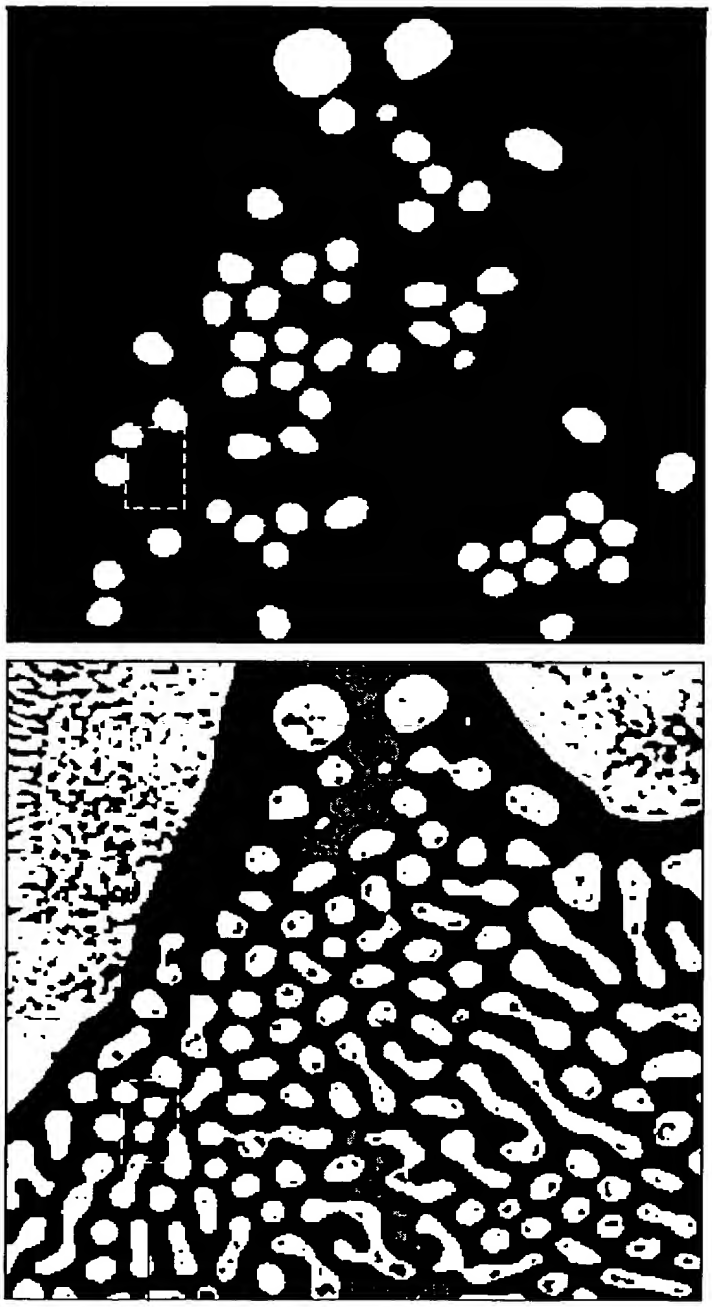

Image after Processing

Original Image (Metal3.jpg)

FIG. 11

00T080" 2596250

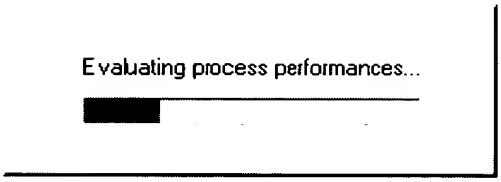

FIG. 12

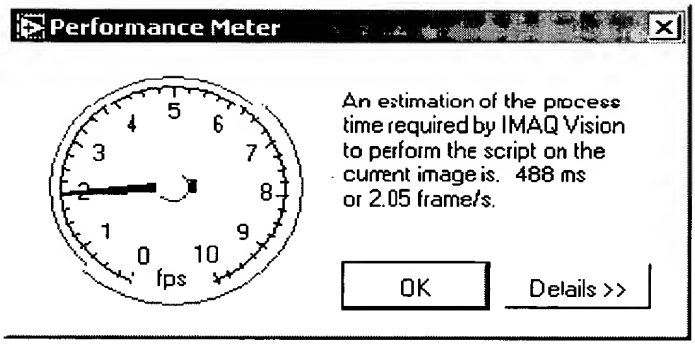

FIG. 13

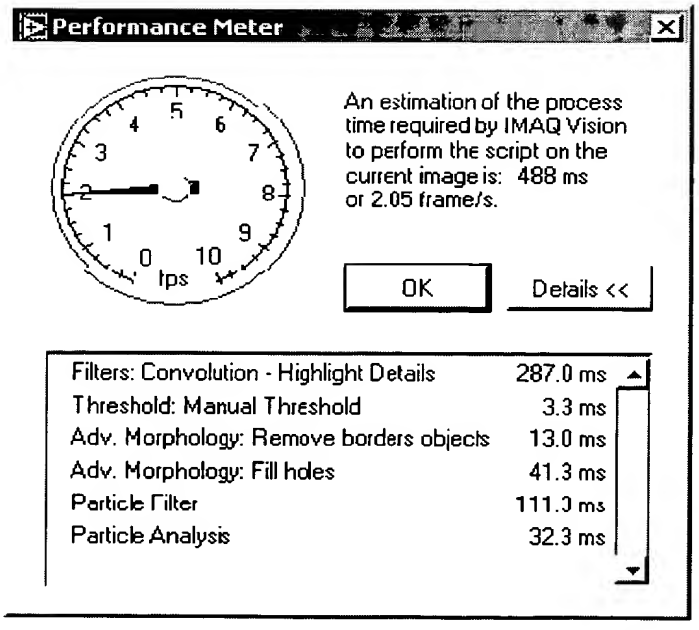

FIG. 14

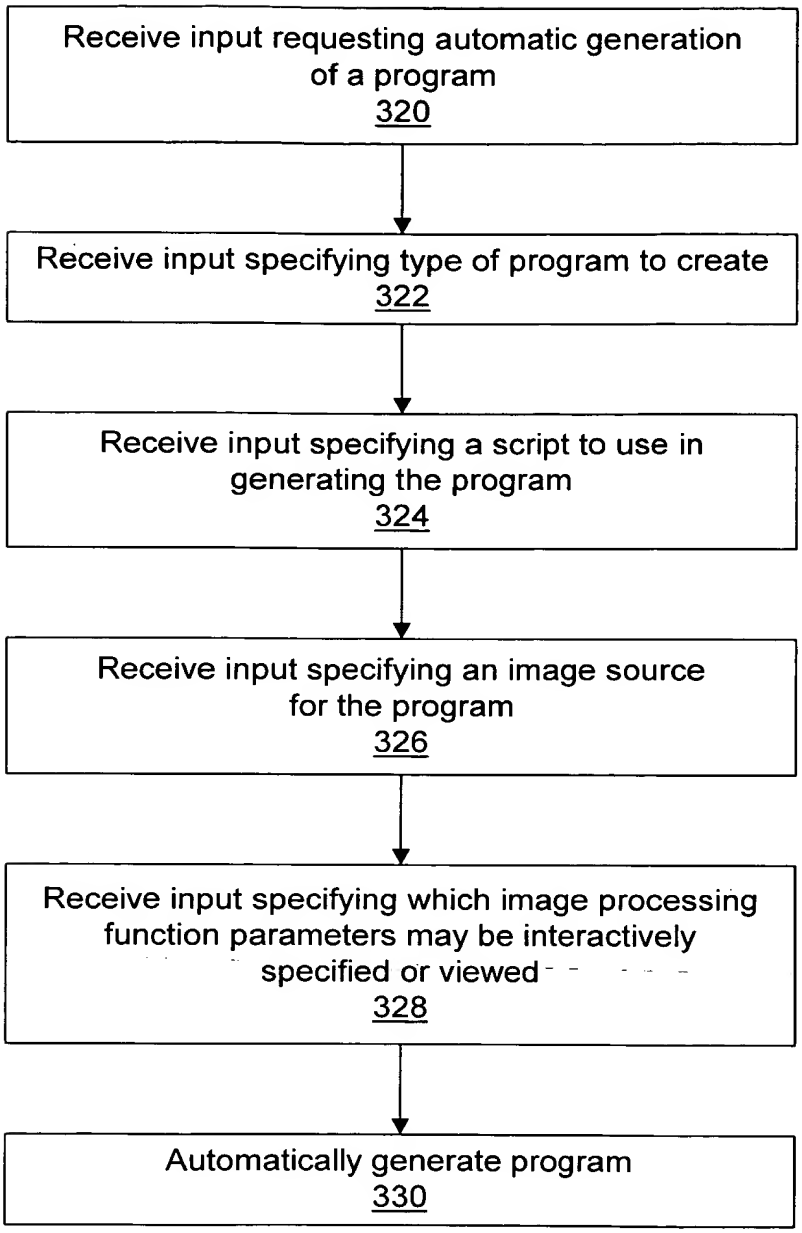

FIG. 15

Docket No. 60035.0003US01

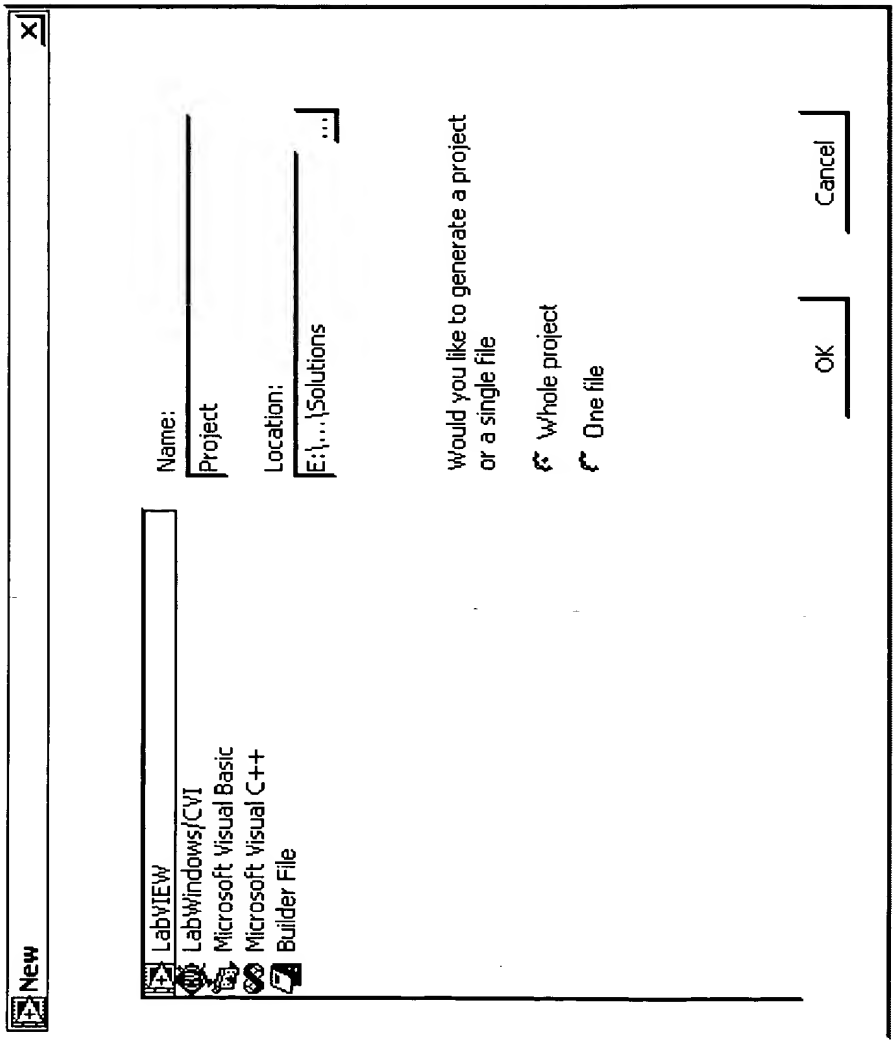
New
LabVIEW
LabWindows/CVI
Microsoft Visual Basic
Microsoft Visual C++
Builder File
Name:
Project
Location:
E:\...\Solutions
...
Would you like to generate a project or a single file
Whole project
One file
OK
Cancel

FIG. 16

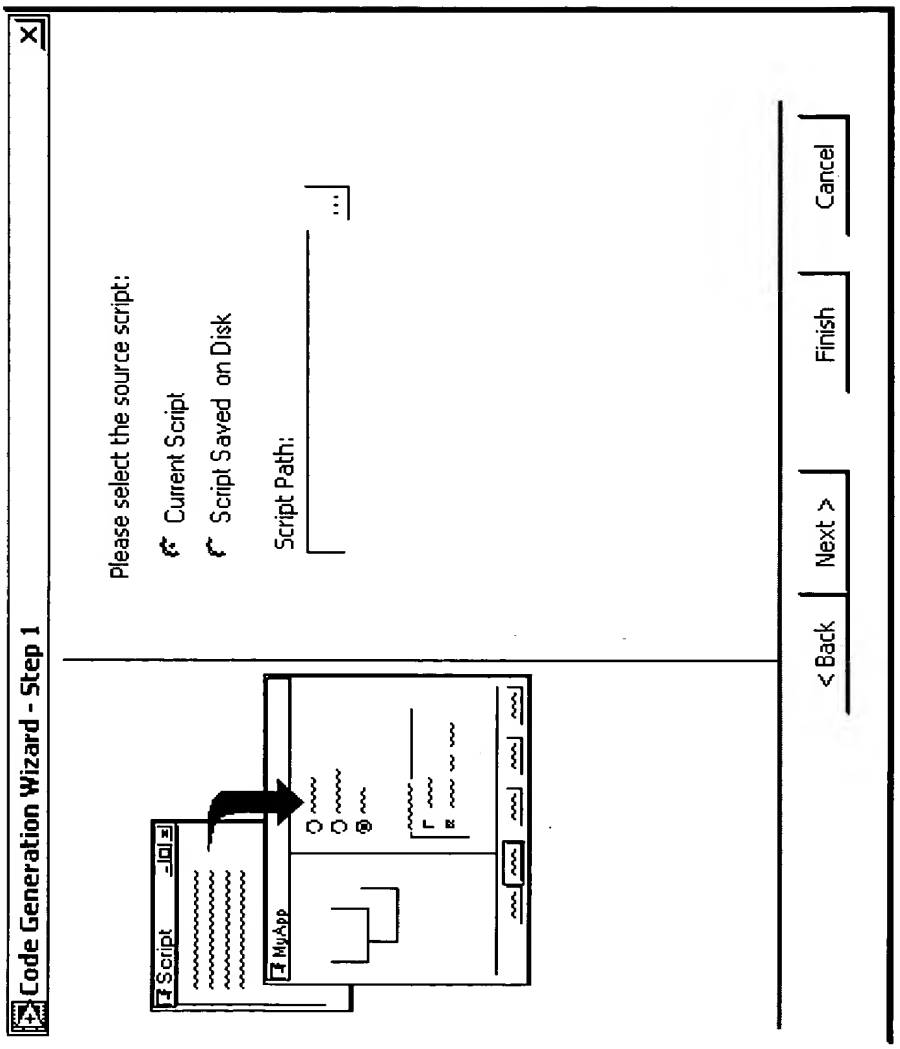
Code Generation Wizard - Step 1
Please select the source script:
Current Script
Script Saved on Disk
Script Path:
...
Script
MyApp
< Back
Next >
Finish
Cancel

FIG. 17

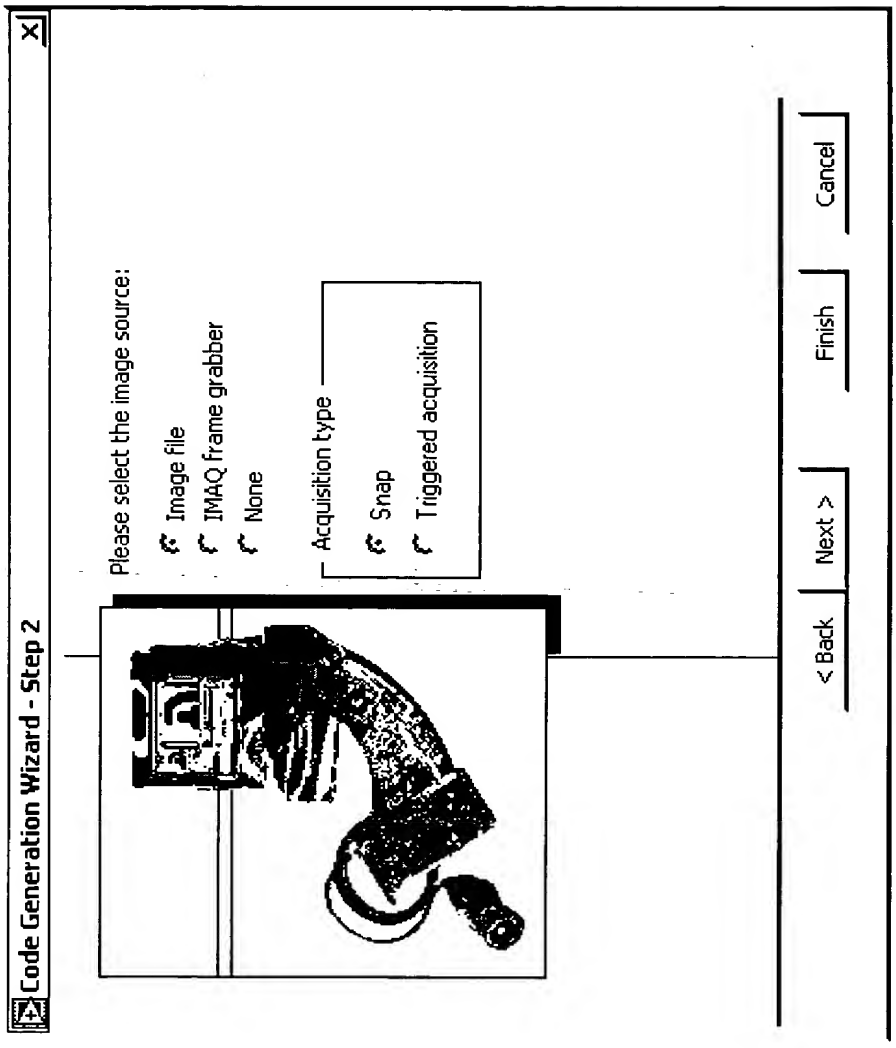
Code Generation Wizard - Step 2
Please select the image source:
Image file
IMAQ frame grabber
None
Acquisition type
Snap
Triggered acquisition
< Back
Next >
Finish
Cancel

FIG. 18

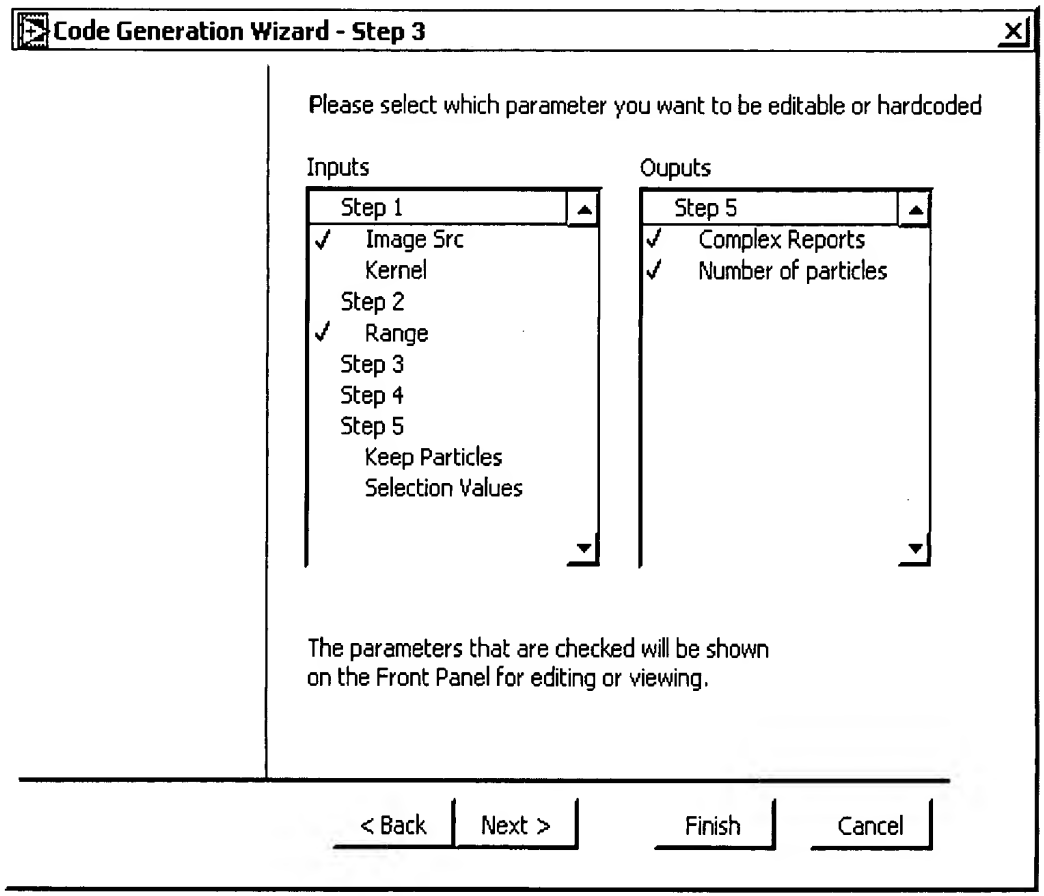
Code Generation Wizard - Step 3
Please select which parameter you want to be editable or hardcoded
Inputs
Step 1
✓ Image Src
Kernel
Step 2
✓ Range
Step 3
Step 4
Step 5
Keep Particles
Selection Values
Ouputs
Step 5
✓ Complex Reports
✓ Number of particles
The parameters that are checked will be shown
on the Front Panel for editing or viewing.
< Back
Next >
Finish
Cancel

FIG. 19

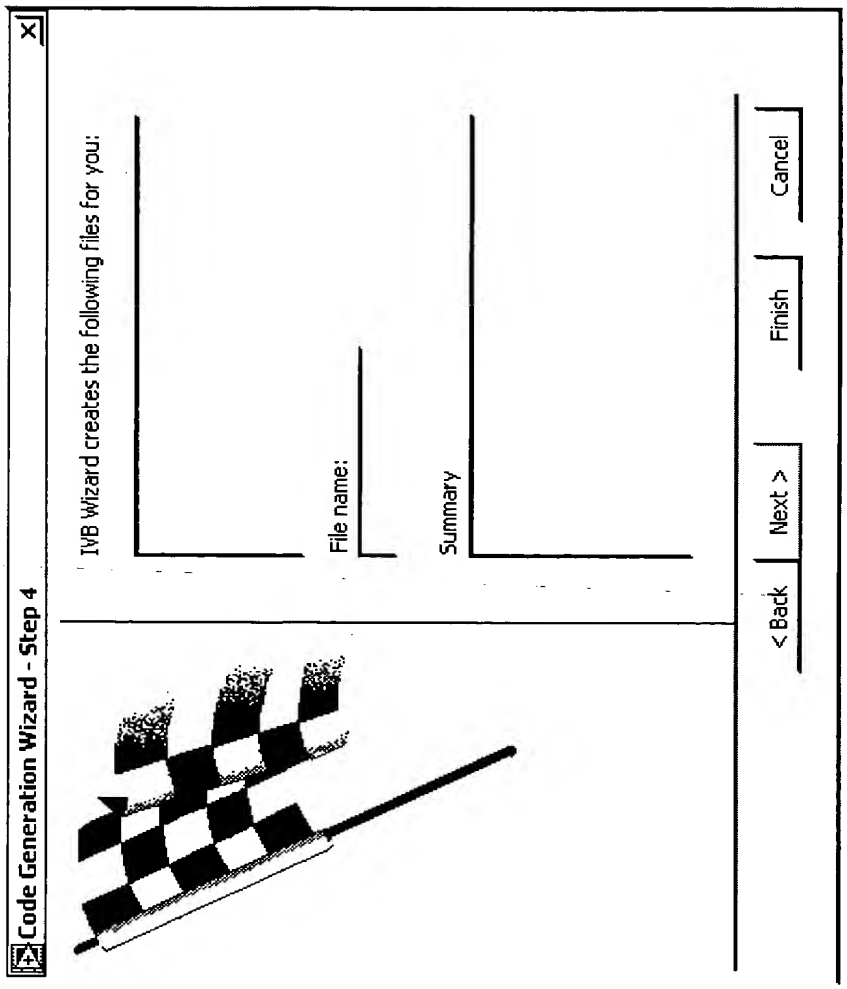
Code Generation Wizard - Step 4
IVB Wizard creates the following files for you:
File name:
Summary
< Back
Next >
Finish
Cancel

FIG. 20

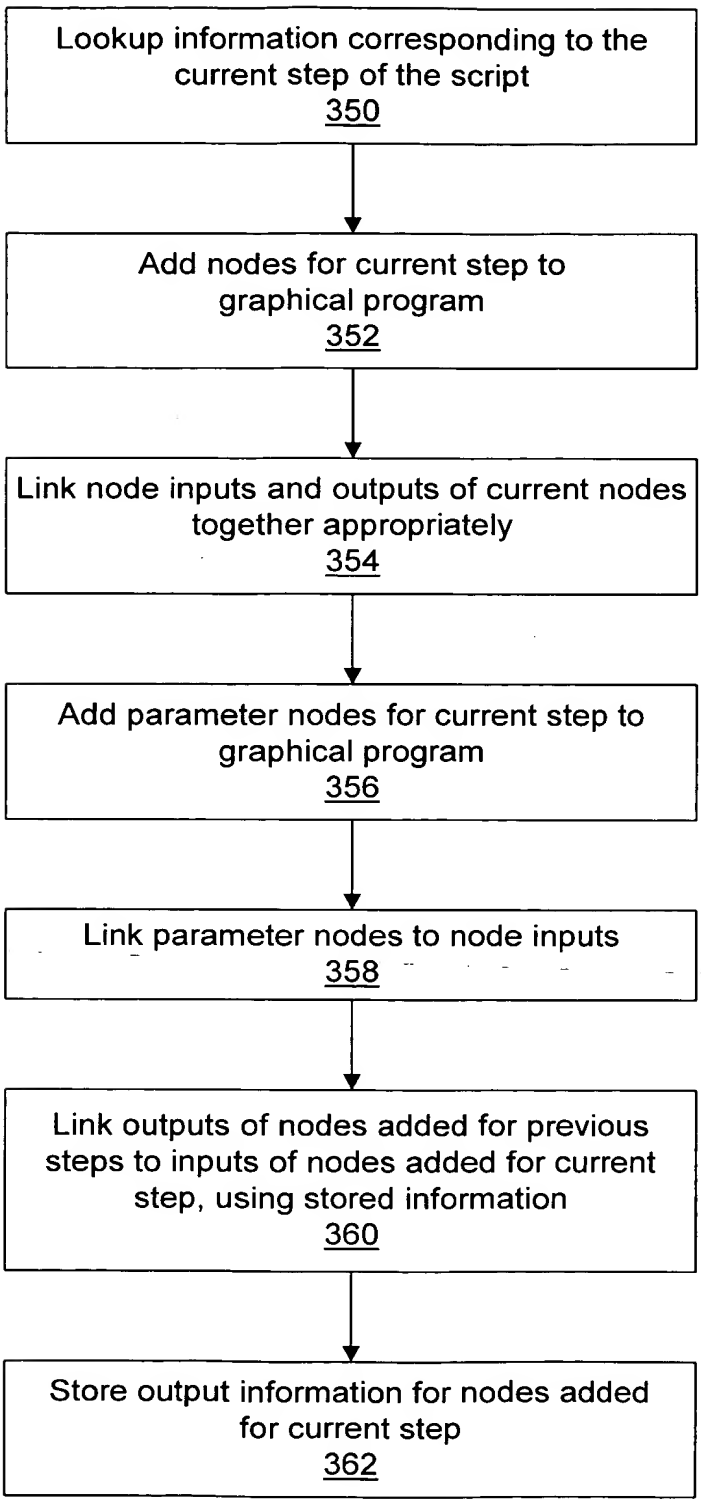

FIG. 21

Docket No. 5150-38900

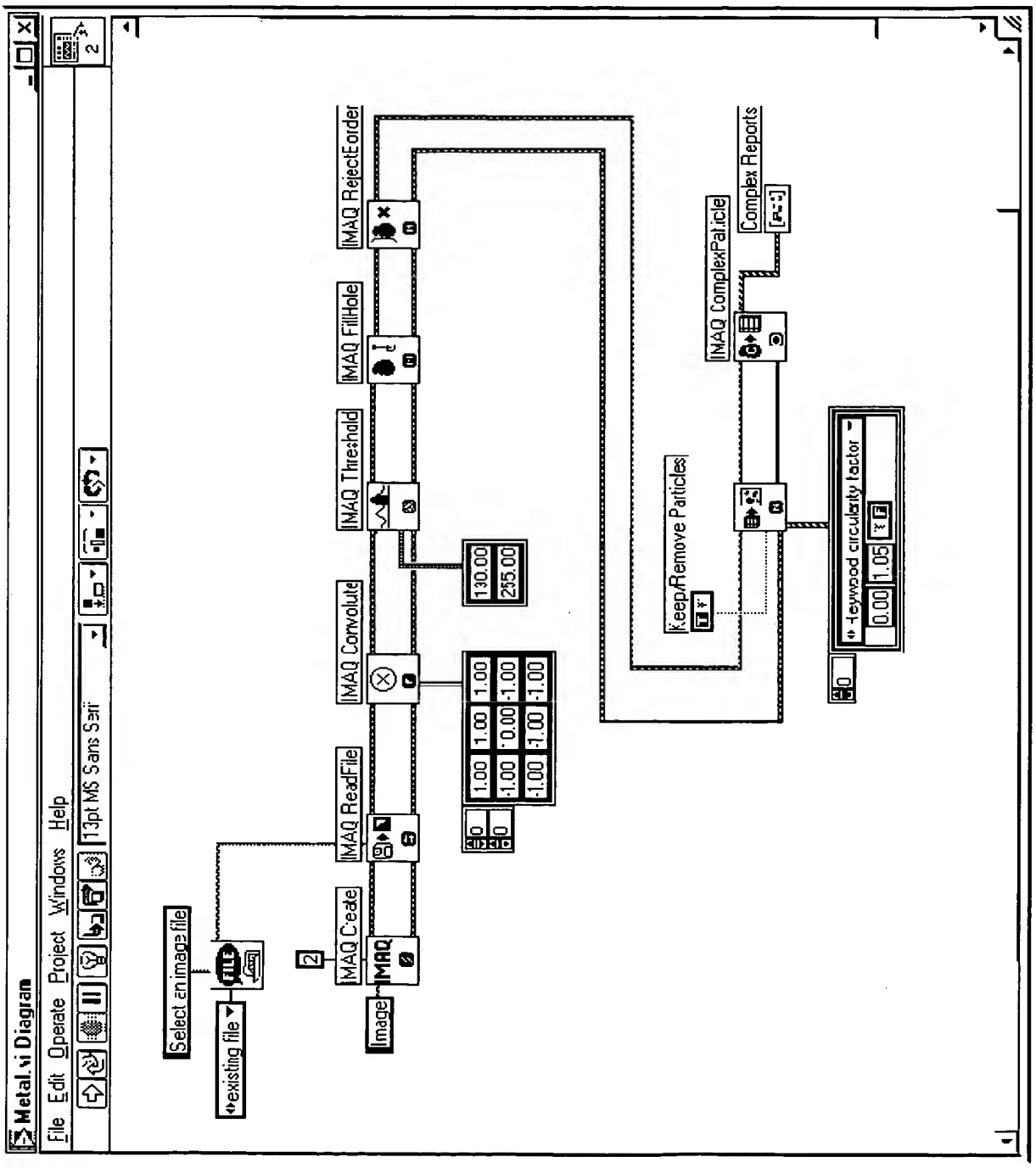
Metal.vi Diagram
File Edit Operate Project Windows Help
13pt MS Sans Serif
Select an image file
existing file
IMAQ Create
Image
IMAQ ReadFile
IMAQ Convolute
IMAQ Threshold
130.00
255.00
IMAQ FillHole
IMAQ RejectBorder
Keep/Remove Particles
IMAQ ComplexParticle
Complex Reports
Heywood circularity factor
0.00
1.05

FIG. 22

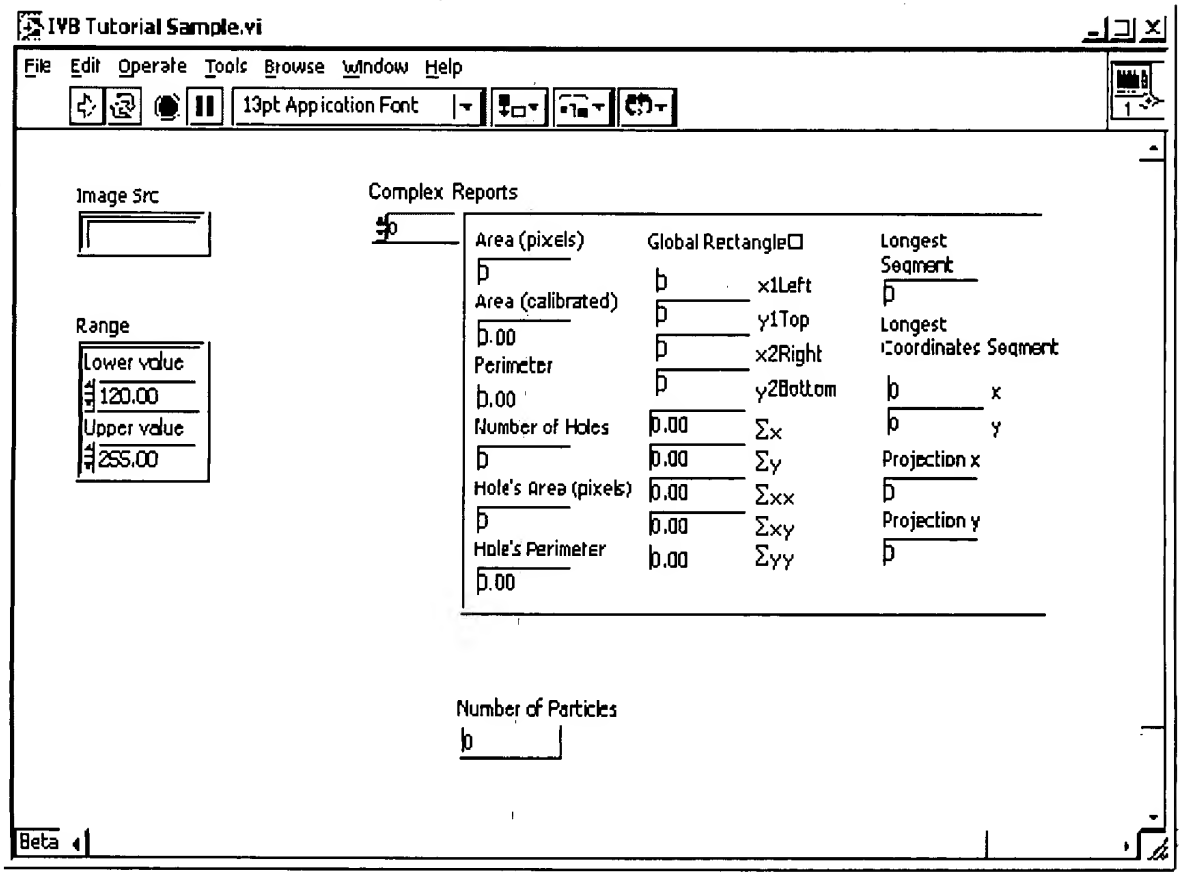
IVB Tutorial Sample.vi
File Edit Operate Tools Browse Window Help
13pt Application Font
Image Src
Range
Lower value
120.00
Upper value
255.00
Complex Reports
Area (pixels)
Area (calibrated)
0.00
Perimeter
0.00
Number of Holes
Hole's Area (pixels)
Hole's Perimeter
0.00
Global Rectangle
x1Left
y1Top
x2Right
y2Bottom
Σx
Σy
Σxx
Σxy
Σyy
Longest Segment
Longest Segment Coordinates
x
y
Projection x
Projection y
Number of Particles
Beta

FIG. 23